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INSTITUTIONALIZATION AND PSYCHO-EDUCATIONAL DEVELOPMENT OF DEAF CHILDREN.

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THE OBJECTIVE WAS TO DETERMINE IF RESIDENTIAL STUDENTS IN INSTITUTIONS FOR THE DEAF PERFORM AT A LOWER LEVEL ON MEASURES OF ACADEMIC ACHIEVEMENT, SOCIAL MATURITY, AND COMMUNICATION ABILITY THAN A SIMILAR GROUP OF STUDENTS WHO ARE DAY STUDENTS AT THE SAME INSTITUTIONS. SAMPLES OF RESIDENTIAL AND DAY STUDENTS AT 15 INSTITUTIONS EDUCATING DEAF CHILDREN WERE MEASURED AND TESTED. THE EXPERIMENTAL VARIABLES SELECTED FOR MEASUREMENT WERE COMMUNICATION ABILITY IN THE ENGLISH LANGUAGE, EDUCATIONAL ACHIEVEMENT, AND PSYCHO-SOCIAL ADJUSTMENT. CONCLUSIONS OF THE STUDY ARE THAT THERE IS NO EVIDENCE THAT LIVING IN RESIDENTIAL SCHOOLS IS GENERALLY DETRIMENTAL TO THE DEVELOPMENT OF DEAF CHILDREN AND THAT RESIDENTIAL SCHOOL LIVING IS NOT IDENTICAL TO THE TYPE OF ENVIRONMENT WHICH HAS BEEN TERMED INSTITUTIONALIZATION. THE STUDY DID REVEAL MAJOR DIFFERENCES IN ORAL COMMUNICATION ABILITY IN FAVOR OF DAY STUDENTS. THESE DIFFERENCES APPEAR TO BE MORE UNDERSTANDABLE IN TERMS OF "ORALNESS OF ENVIRONMENT" RATHER THAN IN TERMS OF INSTITUTIONALIZATION. (TC)

Institutionalization and Psycho-Educational Development of Deaf Children

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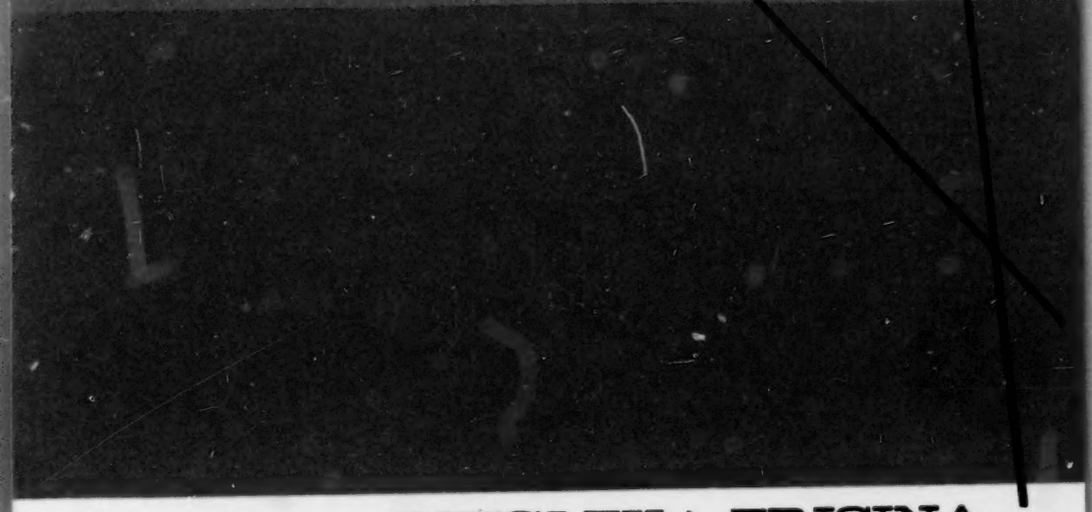

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This study could not have been conducted without the full cooperation of a number of residential schools for the deaf. Grateful acknowledgment is made to the six schools which participated. However, this is not the full story of the cooperation which was obtained. Before selecting the six participating schools, a total of 13 schools were requested to participate and all agreed to do so. Grateful acknowledgment is made of the contribution of the seven schools which did not have sufficient numbers of day students meeting the criteria established for participation in the study.

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INTRODUCTION

Organized education for deaf children in the United States began with the opening of the American School for the Deaf in West Hartford, Connecticut, in 1817. This was a residential school which provided boarding facilities for its students as well as educational facilities and programs. During the next 50 years, state residential schools for the deaf spread throughout the country. Then, in 1869, a change occurred. In that year, the first day school for the deaf was opened in the United States in Roxbury, Massachusetts. Since then, day schools have been established in many cities. The day school provides only educational facilities, and the children live at home. At about the turn of the century, day classes for deaf children were opened in Chicago, Illinois. Day classes differ from day schools in that they have fewer students and are part of regular public schools rather than being located in a separate facility. Both day classes and day schools have the presumed advantage of permitting the deaf child to live at home with his family.

These different types of schools and classes provide deaf children in certain areas with a choice of facilities. The child can be placed in the school best suited to his individual needs. This diversity of facilities, however, raises some problems. It was to be expected that educators would wonder which type of facility was best for most deaf children. One major difference between residential schools and day schools and classes is that in residential schools the children usually must live at the school. This imposes a degree of separation of child from family which many educators believe could be detrimental to the development of the child.

This study is an attempt to approach this problem through research to determine if institutionalization is detrimental to the development of deaf children. In order to understand fully the problem and the approach to it herein used, this chapter provides background information on the problem. The chapter includes: (a) information on the education of the deaf; (b) a discussion of the problem of institutionalization in general; and (c) institutionalization as it applies to the education of the deaf.

The Education of the Deaf [1]

Since the number of deaf persons in the United States is small in comparison to the total population, most hearing persons during their lifetimes have little or no contact with deaf persons. It is to be expected that they will have little knowledge of the problems imposed by deafness, and that what knowledge they might possess is likely to be erroneous in many respects. It is desirable, therefore, to present background information on definitions of deafness, on the special

[1] Part of this chapter is based on an introductory chapter written by the major author for another publication: Rogers, M., & Quigley, S. P. Research needs in the vocational rehabilitation of the deaf. *American Annals of the Deaf*, September, 1960, 105, No. 4, pp. 335-370.

programs of education provided for deaf children, and on the "deaf community" with which many deaf persons function socially.

The Deaf

A number of attempts have been made to formulate definitions of deafness and at least two of the definitions have gained considerable usage. They are: (a) the definition of the White House Conference on Child Health and Welfare; and (b) the definition of the Conference of Executives of American Schools for the Deaf. Both attempt to define deafness in terms of single variables: The White House Conference definition in terms of the time and the method of establishing speech and language, and the Conference of Executives definition in terms of the present functional auditory status of the individual. While each definition has considerable merit, it is recognized today that deafness needs to be defined on the basis of a whole complex of variables which may interact with each other to varying degrees.

Some of the variables which are important in defining deafness and in describing the deaf population are:

1. The degree of loss. This is the traditional psycho-acoustical variable for measuring deafness. The degree of loss usually is measured in decibels. The deaf individual can be described in terms of his degree of loss of awareness of sound.
2. Age at onset of deafness. The age at which an individual loses his hearing is of crucial importance in the educational process and in his psycho-social adjustment. Two individuals might have exactly the same hearing loss as measured in decibels with an audiometer; yet, if one individual were born deaf and the other became deaf at the age of 15, there likely would be profound differences between them in such factors as educational achievement, language development, and speech development.
3. Method of communication used by the deaf individual. There is variation in the methods used by deaf persons to communicate with each other and with hearing persons. Some deaf persons rely almost exclusively on speech and speechreading for communication. Others use mostly the language of signs. Still others depend largely upon the use of finger spelling. Probably the majority use various combinations of these methods as well as written communication.
4. The deaf person's attitude toward his deafness. The reaction of the deaf person to his deafness has important implications for his psycho-social and educational adjustment. He may react by striving to become a member of the hearing community and by refraining from participation in the deaf community. He may react in exactly the opposite manner and shun participation in the hearing community. He may endeavor to function as well as possible in both the deaf and the hearing communities.

These are only a few in the complex of variables which must be considered when attempting to describe the deaf population. Each of the variables should be considered as a continuum along which deaf

persons may be distributed. It is difficult, therefore, to describe or define the "typical" deaf person. Individuals who are termed deaf may vary widely in degree of hearing loss, in age at onset of hearing loss, in methods of communication used, in their attitudes toward their deafness, and in many other factors. For example, an individual might be classified audiometrically as being hard of hearing on the basis of his decibel loss and yet be considered sociologically as deaf on the basis of his acceptance of, and gravitation to, the deaf community rather than the hearing community. Similar interactions are possible among the other variables.

In spite of the wide variation among deaf persons on the dimensions described, it is possible to list some factors which probably are common to most deaf individuals, and which might serve to some extent as being descriptive of the deaf population. Deaf persons have in common the fact that they have hearing losses severe enough to produce serious disorders of communication. These disorders of communication, coupled with the age at which deafness occurs as well as with other factors, produce a need for special education and rehabilitation procedures. Deaf persons also have in common the fact that they are coupled to the world visually. Although recent technological advances in the design and construction of hearing aids, in addition to increased emphasis on auditory training procedures, have undoubtedly improved the utilization of residual hearing by deaf persons, it is likely that most of them still depend primarily on the sense of vision for communication and for the acquisition of information.

Educational Practices

Some of the important factors to be understood in relation to the educational development of deaf children concern the types of schools in which they are educated and the methods of communication which are used or permitted in such schools. There are three major types of educational facilities available for deaf children in the United States: residential schools, day schools, and day classes. Residential schools, whether they be public, private, or denominational, usually provide separate educational facilities and boarding facilities for their students. Day schools generally provide segregated educational facilities except for play and vocational training. In these schools, however, boarding facilities are not provided since the children return home after school hours. Day classes usually are part of regular public school systems located within schools for hearing children and attempt, in varying degrees, to integrate deaf pupils with classes for hearing students.

One important point to be considered here is the effect of the varying degrees of isolation of deaf students from the hearing community which may be presented by these three types of educational facilities. The question is complicated by the fact that the educational and vocational programs provided by the different types of facilities are not comparable in some respects. For example, residential schools often provide quite extensive programs of, and facilities for, voca-

tional training. Where such training exists in day schools and classes, it usually is offered in schools for the hearing where special teachers may be provided to assist the deaf students. The effects of such differences in the programs of the various types of schools should be considered in designing research projects to determine the educational and psycho-social effects of the different types of educational environments.

The problem of different methods of communication used or permitted is often related to the type of school. In general, day schools and day classes use and permit to be used only oral methods. Also, this is usually true in private and denominational residential schools. Most public residential schools, however, use what is termed the combined system. In schools using the combined system, children are instructed by oral methods during the first years in school; however, other classes in which manual methods of communication may be employed are provided for those children who appear not to make satisfactory progress with the oral method. *It should be emphasized that this combined system is not a method for teaching the deaf, but is a system that provides for oral and non-oral classes to be conducted within a single school.* The point of interest here is the non-oral classes. These classes may use the language of signs, finger spelling, the combined method, or the simultaneous method.

The *oral method* includes the use of speech, speechreading, and hearing aids in the communication process. The *combined method* (also known as the Rochester Method) includes the use of speech, speechreading, hearing aids, and finger spelling. The *simultaneous method* includes the use of speech, speechreading, hearing aids, finger spelling, and the language of signs. In addition to these three methods, public residential schools sometimes have classes in which the language of signs is used predominantly. Besides using manual methods of communication in some classes, public residential schools usually permit the students to use these methods of communicating outside of the classroom.

The use of finger spelling and the language of signs in some schools, and their use by the adult deaf, is of interest and importance in research pertaining to the deaf. The language of signs is considered by some to contain all the elements of a formal language. It makes use of manual signs and gestures to convey concepts as contrasted to the use of words for the same purpose. Finger spelling is not a language, but a means of transmitting a language through the use of hand and finger positions representing the letters of the alphabet of the language.

One point in the education of the deaf on which misunderstanding often exists is the use of manual methods of communication. It is important to differentiate between the use of the language of signs and the use of manual English. There appears to be considerable agreement that the language of signs as used by the deaf in the United States differs from English in symbolic and syntactical structure at least. This raises the question as to whether it should be used in educating children who must function in a culture where English

is the dominant language. Such a question, of course, should be extensively investigated by research techniques.

Manual English refers to the use of manual methods of transmitting the English language. This may be through the use of speech and finger spelling with the finger spelling version being exactly the same as the spoken version (combined method), or the use of speech, finger spelling, and signs in the same fashion (simultaneous method). The point of importance here is that manual methods of communication are being used to supplement the spoken form of English and not as a substitute for English.

The Sub-Culture of the Deaf

The terms "sub-culture" and "community" have been used to describe the deaf as an organized segment of society. These terms might be unfortunate choices, but they appear to be the best ones presently available to describe the tendency of the adult deaf to socialize with each other to a greater extent than with hearing persons. This tendency of deaf persons to seek social satisfaction primarily with other deaf persons has resulted in a complex of social organizations among the deaf. It is often little realized by hearing persons that the deaf population in the United States has national professional and fraternal organizations, churches, clubs, insurance societies, newspapers, journals, athletic associations, and other social institutions. Often, these are highly organized on a national and sometimes international level. The athletic associations, for example, are organized to the extent that International Games for the Deaf are held periodically. It is within these formal social organizations and within more informal groupings of deaf people that the adult deaf person usually seeks social intercourse. Within this context, it should be pointed out that deaf persons usually marry other deaf persons. Two studies have indicated that approximately 95 percent of marriages follow this pattern.

This report is not concerned with the social life of deaf people. It is discussed here only because it has been conjectured that the segregation of deaf children in residential schools contributes to the strengthening of the sub-culture of the deaf and that this may not be desirable. These are highly debatable assertions and there presently is little or no evidence to substantiate them. A study of this issue had been planned as a continuation to the present study which deals with only the psycho-educational effects of institutionalization on students in schools.

Institutionalization

Institutionalization involves isolation of children from their parents and their care within institutions. As the term is used, this isolation usually is permanent or of long-term duration, such as when a child is orphaned and reared within an orphanage rather than a foster home. A number of investigators, usually with psycho-analytical

orientation, have claimed that this isolation from parents or parent-figures results in retardation in many areas of development.

The major evidence in this area has been reviewed by Bowlby (1954) and by Stone (1954). Both reviews arrive at the same general conclusion that institutionalization is detrimental to the development of children. Institutionalization appears to affect many areas of development, but apparently is most damaging to personality. Most studies seem to indicate that there is a critical period during which isolation produces the most severe effects. Bowlby (1954, p. 47) states: "The evidence suggests that three somewhat different experiences can each produce the affectionless and psycho-pathic character:

(a) Lack of *any* opportunity for forming an attachment to a mother-figure during the first three years (Powdermaker, Bender, Lowrey, Goldfarb);

(b) Deprivation for a limited period—at least three months and probably more than six—during the first three or four years (Bowlby, Spitz, and Wolf);

(c) Changes from one mother-figure to another during the same period (Levy and others)."

This critical period is of importance when one attempts to relate studies of infant isolation to the practice of providing residential school facilities for the education of certain types of children, such as the blind, the deaf, and the mentally retarded. It has been argued that the segregation of children in such facilities produces the same type of effect as cited by Bowlby and by Stone. It is highly unusual, however, at least in the case of deaf children, for them to enter residential schools as resident students before the age of five or six years. This casts some doubt on the applicability of the studies of infant isolation to the education of deaf children in residential facilities.

Not only does the segregation of deaf children from their families not take place during the crucial years, but it rarely is permanent or of long-term duration since the children usually return home during vacations and often are visited at the schools by their families. In considering the isolation imposed by residential school education, it also is necessary to consider the isolation imposed by deafness. It is not improbable that deaf children, in many instances, might be more isolated among their families and the hearing community than in schools where they can learn to communicate more readily with others.

The studies cited by Bowlby and by Stone generally attribute the ill effects of infant isolation to emotional deprivation as the result of the absence of a mother-figure. Dennis (1960) proposes a different view. He made several developmental measures of children in three different Iranian institutions. In two of these institutions, children were exceedingly retarded in their motor development. In the third, little retardation was present. In the last institution, modern methods of child care were practiced and attendants were trained to give as much attention as possible to each child and to provide learning opportunities for them. In the other two institutions many fewer and

more poorly trained attendants were available and little attention was given to behavioral development. Dennis interprets his findings in view of the different practices of the institutions to mean that the retardation of subjects in two of the institutions was due to the restriction of specific kinds of learning opportunities. In the light of the findings, he believes the explanation of retardation as being due primarily to emotional factors to be untenable.

It is of some importance in considering the case of residential schools for deaf children whether the retardation resulting from infant isolation is due to emotional deprivation or to restricted learning opportunities. It is likely that emotional deprivation could be remedied only by the child's remaining with his parents, whereas the environment usually can be modified to provide enrichment of learning opportunities.

The Institutionalization of Deaf Children

For a variety of reasons, mainly relating to the comparatively small number of deaf children in the total population, most deaf children in the United States residing outside metropolitan areas attend residential schools. In this sense the school serves as a substitute for the family and is concerned with the total psycho-social development of the child as well as with his educational development. As discussed in the preceding section, studies with hearing children reared in institutions of various types indicate that separation from the family can result in detrimental effects to the development of the child. There is some question, however, of the applicability of this conclusion to residential schools for the deaf.

Many of the studies of hearing children have used children who were orphaned or separated from their families by a major catastrophe such as war. A number of the studies apparently indicate that such separation must take place very early in life (before the age of three years seems to be the most critical period) and be permanent, or of long-term duration for the effects of institutionalization to become apparent. Furthermore, the institutions involved often were orphanages where the emphasis was on custodial care. None of these conditions appears to apply wholly to residential schools for deaf children.

Most residential schools do not accept children as resident students before the age of five or six years. The separation from the family is not permanent and probably cannot be considered long-term in duration since children spend regular school holidays and vacations at home and often are visited by their families at the school. Furthermore, these schools are charged primarily with the responsibility for the educational, vocational, and psycho-social development of the child, and custodial care is simply a necessary condition imposed by the residential situation. Nonetheless, the child is separated from his family to a greater extent than if he attended a day school, and it is a legitimate and important question to ask if this separation has ill effects. This is the question the present study attempts to investigate.

Some studies have been conducted which compared deaf children in day schools with deaf children in residential schools. Such a design, however, does not isolate the variable in institutionalization well enough to allow its effects to be studied. There are many differences between day schools and residential schools other than that the children in day schools live at home and the children in residential schools usually live at school, and many of these factors are difficult to control.

Perhaps the largest scale study of this type is that of Upshall (1929). In 1924—25, the National Research Council conducted a survey of the psycho-educational development of 4432 children in 42 schools for the deaf throughout the United States (Day, 1928). From these data Upshall derived *a posteriori* hypotheses regarding differences between children who attended day schools for the deaf and those who attended residential schools. He used all children for whom complete data were available from the National Research Council study. This involved comparison of the performance of 311 day school children with the performance of 1470 children in residential schools.

Upshall (1929, p. 16) summarized the arguments in favor of institutions as follows: "In the institution the children . . . may be able to get, outside of school hours, a part of the education which the hearing child so naturally acquires, for, in an institution, learning continues outside the classroom as well as within." He reasoned from this that children in institutions should have progressed more, educationally, than children who go to day schools for only a few hours a day. In his analysis of the data obtained by the National Research Council's study, Pintner (1927) found the reverse to be true. Children who attended day schools had significantly higher scores on the Pintner Educational Survey Test than those who attended institutions. Pintner also found, however, that children in day schools had higher intelligence, more residual hearing, and lost their hearing at a later average age than children in institutions. Since these factors could account for the obtained differences in educational achievement, Upshall attempted to eliminate their effects. He was able to match 83 children from the day schools with 83 children from the institutions on the above factors. Even when so matched, the day school children still had higher educational achievement than the institutional children. Upshall concluded that the day schools were achieving better educational results than the institutions.

Upshall pointed out that this study could not provide an explanation for these differences. The study showed only that the differences existed at the time of the study and were statistically significant by his procedures of analysis. He indicated that the differences might be due to differences in efficiency of teaching between the two types of schools or to the effects of institutionalization.

A more recent study in this area is that of Templin (1950), who investigated the effects of hearing loss and institutionalization on the reasoning ability of children. She used four groups of subjects: one group from a residential school for the deaf; a second group from a

day school for the deaf; a third group consisting of institutionalized children with normal hearing, and a fourth group of normal hearers from a regular public school. Intercomparisons among these four groups on several tests of reasoning ability allowed Templin to determine the effects of the two variables, hearing loss and institutionalization. Templin (1950, p. 131) stated: "The hypothesis that restriction of the environment will result in lower scores on the reasoning tests is largely supported for the intrinsic factor of hearing loss, and largely rejected for the extrinsic factor of residence in an institution."

This study represents a significant advance over studies which merely compare day schools and residential schools. The use of a control group of institutionalized, normal hearing children permits some isolation of the variable of institutionalization. It should be noted, however, that there are some disadvantages to such a control group. Children with normal hearing who are institutionalized often are atypical in comparison with non-institutionalized children and their separation from family is not usually comparable to the separation imposed on deaf children in residential schools.

The present investigation attempts to isolate the factor of institutionalization in such manner that its effects on the psycho-educational development of deaf children can be studied without contamination by other variables. At the time the study was planned, there were approximately 14,000 deaf children in residential schools in the United States (*American Annals of the Deaf*, 1958, p. 79). Among these 14,000 children there were approximately 1200 who attended residential schools as day students. These day students form the essential control for the study. They are children whose families live close enough to a residential school that the children do not have to reside in the school but can return to their homes after class hours. The factor of institutionalization can be isolated to an extent by using the day students in a number of residential schools as control subjects against whom to compare the performance of resident students in the same schools. Since the two groups of children, day students and resident students, attend the same schools and presumably are exposed to similar educational procedures, a condition which differs between them is that of institutionalization. If these two groups then can be equated on such factors as sex, chronological age, length of time in school, intelligence, type of hearing loss, degree of hearing loss, and age at onset of hearing loss, then institutionalization should be the *major* difference between them.

A residential school for the deaf in this study is defined as a daily full-time residential environment throughout the school year; that is, an educational setting which provides both an academic program and post-academic hours boarding facilities. The student receiving care under these circumstances is herein referred to as a "resident student." The student receiving only the academic portion of this program in the same institution, while living at home during the post-academic hours, is herein referred to as a "day student."

The purpose of the present study is to investigate the effects of institutional environment on the psycho-educational development of deaf children, through the comparison of equated groups of day and resident students in a number of residential schools for the deaf. On the basis of studies of hearing children, it is hypothesized that the institutionalization of deaf children will result in an impoverishment of the psychological environment which will be reflected in lowered performance. The types of performance selected for study are communication ability in the English language, educational achievement, and psycho-social adjustment. The specific hypotheses to be tested in the study are:

1. Resident students in residential schools for the deaf are less proficient in their ability to communicate in the English language than day students in the same schools.
2. The educational achievement of resident students in residential schools for the deaf is significantly lower than the educational achievement of day students in the same schools.
3. The psycho-social adjustment of resident students in residential schools for the deaf is poorer than the psycho-social adjustment of day students in the same schools.

THE SAMPLE

This section describes (a) the methods used in equating the control and experimental groups, (b) the selection and description of the schools which participated in the study, and (c) the selection and description of the subjects.

Methods of Equating the Groups

The plan of the study involved measurement of selected aspects of the performance of resident students (experimental group) and day students (control group) in institutions for the deaf, statistical analysis of any differences found between the two groups on the variables measured, and control of the experimental situation to permit evaluation of the contributions made to any significant differences by institutionalization. In order to isolate the variable of institutionalization, it was necessary to equate the experimental and control groups in such manner that the major differences between them was that the experimental group resided in school after class hours and the control group resided at home. The important variables on which the two groups had to be equated were: (a) educational environment, (b) type of hearing loss, (c) degree of hearing loss, (d) age at onset of hearing loss, (e) sex, (f) chronological age, (g) length of time in school, and (h) intelligence quotient. Since the use of matching alone can seriously reduce the numbers of qualified subjects and also seriously restrict the generalizations that can be made about the findings, it was decided to use matching techniques only where absolutely necessary. Three methods were planned for equating the two groups: restriction of the sample, matching, and statistical equating.

Restriction of the Sample

The two groups were equated on educational environment, type of hearing loss, degree of hearing loss, and age at onset of hearing loss by placing purposeful restrictions on the sample. Educational environment was controlled by selecting the two groups from the same schools. Within each of the six residential schools participating in the study, a group of day students was selected and a comparable number of resident students were equated with them. Type of hearing loss, degree of hearing loss, and age at onset of hearing loss were controlled by restricting the population to be sampled to students who had sensori-neural hearing losses of 75 db or more averaged across the frequencies of 500, 1000, and 2000 cps and who had suffered hearing impairment before the age of three years. It is unlikely that these qualifications restricted the population to any appreciable extent since they probably are characteristic of most deaf students in residential schools.

In addition to the restrictions imposed in these control variables, two other restrictions were placed on the population to be sampled.

Only students who had no disability other than deafness were selected. This was done to eliminate confusion that might have arisen in interpreting the findings had students with multiple handicaps been included. It was required that all students in the sample be at least 11.0 years old at the time of testing. This restriction was necessary due to some of the tests which were to be administered being unsuitable for children younger than this age.

Matching of the Groups

With the population restricted as described, day students and resident students in each school were matched individually on sex, chronological age within 6.0 months, and on length of time in school within 6.0 months. It was found possible to do this in five of the six schools. In the remaining school the day students could not be matched individually with resident students on chronological age and number of years in school within the 6.0 month criterion established. In this school, the two groups were matched on a group rather than on an individual basis. The resulting mean chronological ages of the two groups differed by only 3.0 months and the length of time in school by only 3.9 months. Both means are within the 6.0 month limitation imposed on each of the variables.

Statistical Equating

Since only residential schools with 25 or more day students in attendance were considered for the study, considerable thought had to be given as to how this might affect the population to be sampled. Residential schools for the deaf with this many day students enrolled usually are in centers of large population. This suggests that the day students as a group might have their homes in urban centers whereas the resident students as a group might come from predominantly rural areas. Such a rural-urban split might result in the day students generally having higher intelligence quotients and coming from homes of higher socio-economic status than the resident students.

Rather than attempt to match the two groups on these variables, it was decided to select the subjects as described in the previous two sub-sections and then equate the groups statistically on intelligence and socio-economic status by means of analysis of covariance. Since it was not possible to obtain recent and reliable information on socio-economic status, only the variable of intelligence could be measured. When the data had been collected, it was found that the mean IQ's of the two groups did not differ significantly. In other words, the two groups were found to be matched on IQ although no effort had been made to accomplish this. This rendered the analysis of covariance unnecessary and permitted the use of simpler techniques of statistical analysis.

Selection and Description of Schools

Six schools listed in the January, 1958, issue of the *American Annals of the Deaf* as public residential school for the deaf participated in the study. The populations of these six schools ranged from 218 to 499. Three of the schools employed the combined *system* where both oral and manual classes were present on the same campus. This system is common to most state schools for deaf children in the United States. Two of the other schools employed the combined *method* for all students beyond the primary level. In this method, students are instructed by the simultaneous use of speech and finger spelling. The remaining school used primarily oral methods of instruction. In all participating schools, however, including the oral school, manual communication generally was used among the students after school hours when such children resided in the schools.

The six participating schools were selected from among a group of 13 which had expressed willingness to participate in the project. These 13 schools were considered on the basis of having 25 or more day students enrolled. A questionnaire was completed by each school stating the number of their day students meeting the criteria described in the sub-section: Restriction of the Sample. From the information obtained on the questionnaire the six participating schools were selected. They were chosen primarily on the basis of having 20 or more day students who met the established criteria. Consideration also was given to including schools representing the three major types previously described and to providing as wide geographical representation as possible.

TABLE 1
NUMBER OF SUBJECTS IN EACH SCHOOL

School	Region	Day Students			Resident Students		
		M	F	Total	M	F	Total
A	Middle Atlantic	15	15	30	15	15	30
B	Middle Atlantic	7	3	10	7	3	10
C	East North Central	10	7	17	10	7	17
D	West North Central	13	7	20	13	7	20
E	West South Central	18	18	36	18	18	36
F	Pacific	4	3	7	4	3	7
	Totals	67	53	120	67	53	120

Table 1 identifies the region in which each school was located and the number of day students and resident students, male and female, tested in each school.

Selection and Description of Subjects

Within each of the six participating schools, all day students were identified who met the established criteria of having a sensori-neural

hearing loss, of having a hearing loss of 75 db or more in the better ear averaged across the frequencies 500, 1000, and 2000 cps, who suffered hearing loss before the age of 3.0 years, had no disability other than deafness, and were at least 11.0 years old at the time of testing. The data on these variables were obtained from school records. With the control group of day students thus identified, an equated group of resident students was sought. All resident students meeting the population criteria were identified from school records. Each day student then was matched individually with a resident student in the same school on sex, chronological age within 6.0 months, and on number of years in school within 6.0 months. Where more than one resident student was found to match any given day student, a random selection was made from the possible choices. In one school, as stated previously, matching had to be performed on a group basis rather than individually. A total of 120 day students, 67 male and 53 female, and 120 resident students, 67 male and 53 female, were selected in the six participating schools.

The two groups of students identified by these procedures formed the sample for the present study. Table 2 gives the descriptive data for the sample. These data were obtained from school records for the variables of chronological age, length of time in school, degree of hearing loss in the better ear, and age at onset of hearing loss. It was decided in advance that IQ would be measured by the Chicago Non-Verbal Examination. Where this test had been administered by the school, the school's score was used. Where this test had not been administered previously by the school, it was administered as part of the testing program of the present study. Chicago Non-Verbal scores were obtained for 225 students. For 15 other students, WISC Performance Scale scores were used from the school records. This was made necessary by limitations on testing time.

TABLE 2
SCORES ON CONTROL VARIABLES FOR
DAY AND RESIDENT STUDENTS

Variable	M (d)[1]	M (r)[2]	S.D. (d)	S.D. (r)	t	Level of Significance
Time in School (months)	107.92	105.76	31.17	34.20	< 1.00	NS
Chronological Age (months)	167.06	168.66	28.23	27.98	< 1.00	NS
Hearing Loss in Better Ear (db)	85.76	86.43	9.75	10.51	< 1.00	NS
Age at Onset of Hearing Loss (months)	5.83	3.68	10.06	7.20	1.90	NS
IQ	101.34	102.88	14.07	14.21	< 1.00	NS

[1] d = day students (N = 120)
[2] r = resident students (N = 120)

The validity of using WISC Performance Scale scores for 15 students was checked by correlating WISC Performance Scale scores with Chicago Non-Verbal Scores in one school. The psychologist in this school had previously obtained scores on the two tests for 117 students. He found the means to be 96.32 on the Chicago Non-Verbal and 96.81 on the WISC Performance Scale. The correlation between the tests was 0.79. The similarity of the means and the high correlation coefficient were considered sufficient justification for using the WISC Performance Scale scores for the 15 students where time prohibited administering the Chicago Non-Verbal Examination.

Examination of Table 2 will reveal that no statistically significant differences were found between the day students and the resident students on any of the control variables. The *t* of 1.90 for age at onset of hearing loss approached significance and it is obvious from the means and variances that the distributions of this variable for both the day and resident groups were badly skewed. Even if such a difference had been statistically significant, however, it would be psychologically meaningless. The fact that a child became deaf at 5.83 months of age rather than at 3.68 months of age is hardly likely to have any effect on his development. Thus, the selection procedures used yielded six public residentia' schools for the deaf representing the three major systems and methods of instruction (the combined system, the combined method, and the oral method), and two groups of students from these schools (120 day students and 120 resident students) who were equated in educational environment, sex, chronological age, length of time in school, type of hearing loss, degree of hearing loss, age at onset of hearing loss, and intelligence quotient. The assumption was made that the major difference existing between the two groups of students was in environment after class hours. The day students returned to their homes after class whereas the resident students resided in the school at least during the school week. The study was designed to compare the two groups on a number of variables in order to determine if this difference in environment resulted in any significant differences in performance.

PROCEDURE

In this chapter, instruments and techniques for measuring the experimental variables, procedures used in collecting data, and techniques of statistical analysis are described.

Measurement of the Experimental Variables

Although the practice of educating deaf children in residential schools might be detrimental to certain areas of their development, it also is possible that such an environment might be beneficial in other aspects of development. It was decided, therefore, to compare the equated groups of day students and resident students on as broad a sampling of psycho-educational behavior as possible, rather than limit the comparisons to selected variables where the effects of institutionalization might be most expected to have a detrimental effect. The time available for testing influenced, of course, the amount of testing that could be performed. After considering these qualifications and examining the past literature on institutionalization and on the education of deaf students, three broad areas of performance were selected for assessment: communication ability in the English language, educational achievement, and psycho-social adjustment.

Communication Ability

Communication ability in the English language, for the purposes of this study, included speech, speechreading, finger spelling, and vocabulary. The qualifying phrase "in the English language" was placed upon communication ability in order to emphasize that no attempt was made to assess ability to communicate by means of the language of signs. The language of signs is used widely among deaf persons of all ages as a means of communication. It is considered by many individuals who are familiar with it to be a language in its own right with a linguistic structure different from that of English and other spoken languages, and there is some evidence to support this point of view (Stokoe, 1960). It would have been of interest to have included assessments of this communication method in the present study, but absence of measuring instruments, and other factors, made this impractical.

Speech proficiency was assessed from taped samples of the speech of the subjects. Each subject read the Phonetically Balanced Familiar (PBF) Words for recording. These 50-word units were selected from the original Harvard PB lists and standardized for use with deaf children by Hudgins (1949).

Speechreading ability was assessed by means of Form A of the Utley Test of Lipreading (Utley, 1946). Only the sentence portion of this filmed test was used due to realistic limitations on the time that students were available for testing. This portion of the test consists of 31 simple sentences presented on film by a female speaker.

There is evidence which indicates that this test is a difficult one for deaf students (DiCarlo, 1951), but it was considered suitable for the present study because of the reported high reliability coefficient, .87, between the two forms, A and B, of the Sentence Test. This was considered of importance since the purpose of the present study was to compare two groups of subjects rather than to establish norms for deaf students on a speechreading test.

Ability to read finger spelling was assessed by means of a specially prepared test since no standard instrument was available in this area. A deaf instructor at Gallaudet College, noted for the clarity of his finger spelling, was instructed to spell the 31 sentences of Form B of the Utley Lipreading Test at a "comfortable rate of speed." A film was made of this production and formed the finger spelling test. It should be noted that no attempt was made to determine the validity and reliability of this instrument. The original plan of the study did not include finger spelling as a variable, but it was later decided to obtain some data on it as a preliminary to constructing a standardized test of finger spelling for use in future projected studies of manual and oral communication ability among deaf persons. The results obtained from use of the non-standardized instrument are presented in this report as a matter of interest.

Vocabularly development was measured with the Word Meaning section of the Durrell-Sullivan Reading Achievement Test (Durrell, 1937). This reading test has been used in previous studies of the reading ability of deaf students. Either the Primary or the Intermediate form was administered depending on the grade level of the student as determined by school records. The Primary form contains 50 words and the Intermediate Form 75 words. A student's score can be converted to a grade level by the use of tables constructed from data obtained on children in the public schools.

Educational Achievement

All six of the schools selected for the study regularly administer the Stanford Achievement Test to their students. By a fortunate coincidence, these schools generally administer the test in the same month of the year. The data on this test were obtained from the school records for the year prior to the study. Thus, the collection of data for the study was conducted in 1960, but the educational achievement scores were obtained from tests administered by the schools in 1959.

Psycho-Social Adjustment

The original plan of the study involved the administration of the Vineland Scale of Social Maturity. The selection of this test had been based on past studies which indicated that deaf children in residential schools were significantly retarded in social maturity (Bradway, 1937; Burchard, 1942) while another study indicated that this was not true for a sample of deaf children in a day school (Streng, 1938). These studies were not readily comparable and so it was not possible to attribute the apparent differences in social

maturity to the effects of institutionalization. The design of the present study might have contributed information on this problem; however, it was not possible to administer the Vineland Scale of Social Maturity in the project. This test is administered by interview with an individual who is familiar with the social life of the testee. In the case of the resident students in the present study, this could have been a selected individual residing in the school. In the case of the day students, the individual would need to be a parent of the child and these persons were not readily available. The problem is mentioned here since a study concentrating on the area of social maturity and using the design of the present study might be feasible and worthwhile.

After rejecting the Vineland Scale of Social Maturity for the stated reasons, it was decided to use the Haggerty-Olson-Wickman [2] Behavior Rating Schedules. This test has been used in a number of studies of deaf children and has the advantage that it can be administered to the teachers of the children. Both Schedule A, the Behavior Problem Record, and Schedule B, the Behavior Rating Schedule, were administered. Total scores were obtained for each of the two schedules and for each of the four divisions of Schedule B dealing with intellectual adjustment, physical adjustment, social adjustment, and emotional adjustment.

Collection of Data

The data for the study were collected from available school records, and from testing conducted by the major author.

School Records

All of the participating schools made their records freely available for the study. From these records, data on sex, chronological age, length of time in school, educational status (day or resident student), type of hearing loss, degree of hearing loss, age at onset of hearing loss, and educational achievement were obtained. For some of the subjects the intelligence quotients also were obtained from the school records where these quotients had been obtained on the Chicago Non-Verbal Examination. Where such quotients were not available in school records, the Chicago Non-Verbal Examination was administered as part of the testing program of the study with the exceptions discussed in the chapter on the sample.

Testing Program

A major problem in testing deaf children is the establishment of rapport. This often requires the ability to communicate with them by means of finger spelling and the language of signs, and in addition requires some knowledge of the special language difficulties which most deaf children experience. The major author of this report, who conducted the testing program, has some familiarity

[2] Hereafter referred to as "H O W."

both with the communication and the language problems; nevertheless, it was considered desirable to enlist the aid of school personnel in the testing program whenever possible. Where a suitably qualified individual was available in a school, his help was sought with the testing. All of the testing, however, was supervised and largely conducted by the investigator. All of the schools involved allowed the investigator to use any method of communication necessary to instruct the subjects. In most instances, this involved the use of speech, finger spelling, and writing.

Group testing. The major portion of the testing program involved the area of communication ability where tests of speech, speechreading, finger spelling, and vocabulary were administered. The tests of speechreading, finger spelling, and vocabulary were administered to groups of students at a single testing session of approximately 90 minutes. The size of the groups varied between six and 12 depending on the age of the subjects with the younger children being tested in the smaller groups. The tests were administered in the following order: finger spelling, speechreading, and vocabulary.

The finger spelling and speechreading films were shown on standard motion picture equipment made available by each school. The subjects were supplied with prepared forms on which to write the sentences which were presented in the two films. On each film a series of five simple sentences was presented first as examples. The standard instructions for the administration of the Utley Test of Lipreading generally were adhered to, with minor exceptions, and with the appropriate changes in wording for the finger spelling test. Care was taken during the presentation of the sample sentences that each subject fully understood what to do. Test sentences then were presented and ample time was allowed at the end of each sentence for the subject to write down what he perceived.

Both the finger spelling test and the speechreading test contain 31 sentences with a total of 124 words in the speechreading test and 126 words in the finger spelling test. The test is scored on the basis of the number of words correct. This was done in the present study and the number of words correct for each subject was converted to the percent correct of the total number of words.

The vocabulary test was administered immediately following the speechreading and finger spelling tests. Depending on his grade level, each student took the Word Meaning section of either the Primary or the Intermediate form of the Durrell-Sullivan Reading Achievement Test. The Primary form contains 50 words and the Intermediate form contains 75 words. The standard instructions were adhered to as closely as possible with care being taken that each student understood exactly what to do. The scores for each student were converted to grade levels using the norms in the test manual.

Where it was necessary to administer the Chicago Non-Verbal Examination, this was done on a group basis by the school psychologist. Testing was conducted in groups ranging from six to 12 with the younger children again being tested in the smaller groups. The

standard instructions were used but usually communicated by finger spelling and the language of signs as well as by speech and writing. Care was taken that each subject fully understood the instructions before he began the test. Scoring and conversion to intelligence quotients were performed in the standard manner.

Individual Testing. The speech tests and the H O W Behavior Rating Schedules were administered individually. In the admistration of the H O W, those teachers within each school who were most familiar with one or more of the subjects in that school were selected to complete the schedules. These persons were given instructions, both oral and written, on the nature of the test and how to complete it. The only modification made in the standard instructions was that the teachers were requested to omit the item on Schedule A for rating the subjects on speech. It was believed that this item was unrealistic since practically all deaf children have severe difficulties in speech. The standard scoring procedures were used resulting in a total score on Schedule A and a total score and four sub-scores on Schedule B.

The most difficult area of assessment was speech proficiency. Consideration was given to constructing a rating scale by means of which teachers could have rated the speech of the subjects, but this was rejected on the grounds that such an instrument might not be sensitive enough to detect differences that might exist between the day students and resident students on this important variable. It was decided to assess speech proficiency on the intelligibility of tape-recorded samples of each subject's speech.

The PBF Words were used as the test items. These 50-word units were selected from the original Harvard PB word lists by Hudgins (1949) for use in assessing the speech of deaf children. Four lists were used and the words on each list were scrambled by random selection to provide five versions of each list, thus giving a total of 20 lists of 50 words each. These lists were mimeographed for presentation to the subjects.

All recordings were made on a portable Ampex 601 tape recorder with an Electro-Voice Model 636 microphone. This equipment was transported to each school by the investigator so that the same recording apparatus was used for all subjects. The recordings were made in a suitably quiet room provided by each of the participating schools. The procedures for testing outlined by Hudgins were adhered to as closely as possible.

Each student was tested individually. Prior to the recording, the student was given a copy of the list of words he was to read and was allowed to read these silently for as long as he wished in order to familiarize himself with the words. Then he read the list to the investigator who corrected obvious mispronunciations. This procedure was repeated until the student knew the correct pronunciation of each word. He then was given a sample list of words to read aloud and the tape recorder was adjusted to provide a suitable recording level. The subject then was given the test list of words and instructed to read them aloud. He was told to pause and raise his

hand before attempting any word of which he was still unsure. When this occurred, the tape recorder was stopped and the subject coached until he could pronounce the word correctly. This procedure was repeated until all 50 words had been recorded. These rather elaborate and time-consuming coaching procedures were necessary to ensure that the test was one of speech intelligibility and not of vocabulary.

The intelligibility of the speech recordings was judged by a group of trained listeners. According to Hudgins, the selection of listeners is of importance. If persons with considerable training and experience in teaching speech to deaf children are used, the intelligibility scores are likely to be unrealistically high. If persons completely unfamiliar with the speech of deaf children are used, the opposite effect is likely. In this study, a procedure similar to that proposed by Hudgins was used.

Four graduate students in the teacher training class at Gallaudet College served as listeners. These persons had normal hearing and discrimination as determined by a speech intelligibility test which was administered prior to their selection. After their selection, they were required to listen to the recorded speech of a number of deaf children who were not subjects in the present study. Several training sessions of approximately 90 minutes were conducted until the listeners reached a plateau in their learning curve. When this had been accomplished, the listeners audited the speech recordings of the subjects in the study.

The auditing sessions were conducted for 90 minutes three times a week. The total assessment procedure required about eight weeks. All sessions were conducted in a sound-treated room. The recordings were played back on an Ampex 601 tape recorder with matching amplifier-speaker. After each word had been presented, listeners were allowed time to write down on a prepared form what they perceived. Each deaf student's score was the average of the number of words correctly identified by the four listeners. The average number of words correct was converted to percent correct of the 50 words.

The use of listener-identification of tape-recorded words is a very rigid measure of speech proficiency. Low scores usually are made on such tests by deaf children; however, it will be remembered that the purpose of the present study was to compare two groups of deaf students and not to establish norms for speech ability. A study to establish norms for speech likely would need to evaluate all aspects of speech production rather than just the single variable of word intelligibility used here.

Methods of Statistical Analysis

The original plan of the study called for use of the analysis of covariance as the test of statistical significance. This had been planned in order that expected differences in IQ between the two groups could be equated statistically rather than by matching. When

the data on all of the control variables had been collected, it was found that there was no statistically significant difference between the two groups in IQ. Since the groups were equated on all of the control variables, it was not necessary to use the analysis of covariance. The *t*-test for matched groups was used.

In this study, the .05 level of significance was used for accepting or rejecting null hypotheses, but where the differences exceeded the .01 level this is stated. Although the direction of the relationship was predicted in advance for some of the hypotheses, two-tailed tests of significance were used throughout.

Summary

This chapter and the chapter on the sample have described the major variables considered in the study. These are listed in Table 3 which summarizes the types of variables and the procedures by which data on the variables were obtained. The control variables are those on which the two groups were equated. The experimental variables are those on which the two groups were compared to determine the effects of institutionalization.

TABLE 3
CONTROL AND EXPERIMENTAL VARIABLES

Variables	Data Collection
Control	
Educational status (day or resident)	School records
Type of hearing loss	
Degree of hearing loss	
Age at onset of hearing loss	
Sex	
Chronological age	
Length of time in school	
Intelligence quotient	School records or testing
Experimental	
Speech	Testing
Speechreading	
Finger spelling	
Vocabulary	
Personal and social adjustment	
Educational achievement	School records

RESULTS

The experimental variables studied involved three areas: (a) communication ability which included measures of speech, speechreading, finger spelling (manual alphabet), and vocabulary; (b) educational achievement as reflected in the Stanford Achievement Test; and (c) personal and social adjustment as indicated by the two total scores and four subscores in the H O W Behavior Rating Schedules. These eleven experimental variables were analyzed and comparisons were made between the following:

1. Total sample of 120 deaf day students and the 120 deaf resident students.
2. Sixty-seven male day students and 67 male resident students.
3. Fifty-three female day students and 53 female resident students.
4. Fifty-three female resident students and 67 male resident students.
5. Fifty-three female day students and 67 male day students.

The first three comparisons relate directly to the hypotheses regarding institutionalization. The first comparison utilizes the two groups without regards to sex. The second and third comparisons investigate the effects of institutionalization for males and females separately to determine if the effects varied with sex. These three comparisons are reported in Table 4 through Table 14.

The fourth and fifth comparisons study differences for males and females with residence status held constant. These data are not reported in the tables since they were not a matter of primary interest in the study. They are reported and discussed in the text.

In addition to comparisons between the means and variances of the total sample and four subgroups, intercorrelations among all of the measured variables were computed. The first part of this chapter deals with the testing of the hypotheses; the last deals with the intercorrelation of the variables.

Testing of Hypotheses: Communication Ability

Data on four experimental variables—speech, speechreading, finger spelling, and vocabulary—are given in this section. With each variable, the five comparisons reported above were made.

Speech

Speech proficiency was assessed by using the PBF Words lists. The mean percent of words correctly identified by trained listeners was the factor used in the comparisons. Table 4 shows that, for the total sample, day student means were significantly higher ($p=.01$) than those of resident students. When sex was held constant, day male student performance was consistent with the total sample, again significant at the .01 level. Day female students were also significantly higher ($p=.01$) on speech proficiency. This superiority of the day female students is similar to that of the total sample and

TABLE 4
SPEECH PROFICIENCY AS MEASURED BY PBF WORD LISTS

Groups	N	Mean Percent Words	S.D.	t	Level of Significance
		(percent words correct)			
Total Sample					
Day	120	17.28	17.56		
Resident	120	10.60	12.57	3.43	.01
Male Students					
Day	67	16.94	18.59		
Resident	67	9.94	10.60	2.68	.01
Female Students					
Day	53	17.71	16.15		
Resident	53	11.42	13.82	2.15	.05

male student comparisons, which suggest a statistically significant difference in favor of the day students in speech proficiency as measured in this study.

Sex differences were also investigated with residence status held constant. The difference between means for male and female resident students was not statistically significant, nor was that for male and female day students.

Speechreading

Speechreading ability was measured with the sentence test of the Utley Form A filmed test, "How Well Can You Read Lips?" Comparisons were made between day and resident students in the total sample as well as separately for male and female students. These data are presented in Table 5. The difference between means for

TABLE 5
SPEECHREADING ABILITY AS MEASURED WITH THE UTLEY SENTENCES, FORM A
(percent words correct)

Groups	N	Mean Percent Words	S.D.	t	Level of Significance
Total Sample					
Day	120	14.07	11.82		
Resident	120	8.91	9.56	3.71	.01
Male Students					
Day	67	11.95	10.25		
Resident	67	7.52	8.06	2.79	.01
Female Students					
Day	53	16.76	13.07		
Resident	53	10.68	9.90	2.71	.01

these three comparisons, all significant (p=.01) were in favor of day students. The data for male and female students support the consistency of the total sample. These findings suggest that the resident variable is of significance in view of the superiority demonstrated by the day students on the speechreading test utilized in this study.

These data were also analyzed to determine whether speechreading varied with sex. In order to do so, the factor of residence was controlled. When male and female resident students were compared, resident females tended to be more proficient, but the difference was not statistically significant (t=1.88; .05=1.98). However, the mean performance of female day students was significantly higher (p=.05) than that of male day students (t=2.20).

Finger Spelling

The ability to read finger spelling was assessed with a filmed test. The sentences used in the construction of this test were those of the Utley Form B, which is an alternate form of the Form A test of speechreading used in this study. The mean percent of words correctly identified by male and female day and resident students were compared.

As can be seen in Table 6, no significant differences were obtained between the mean percent of words correctly identified by day and resident students, either for the total sample or for the male and female subgroups.

Similarly, no significant differences were found between the performance of male and female students in either the day (t=1.85) or resident (t=1.82) samples. Although the female resident group mean score was higher than that of any other subgroup, it was not significantly different in this respect.

TABLE 6

FINGER SPELLING ABILITY AS MEASURED WITH THE UTLEY SENTENCES, FORM B

(percent words correct)

Groups	N	Mean Percent Words	S.D.	t	Level of Significance
Total Sample					
Day	120	53.44	30.35	< 1.00	NS
Resident	120	56.41	27.69		
Male Students					
Day	67	48.94	29.55	< 1.00	NS
Resident	67	52.36	27.12		
Female Students					
Day	53	59.13	30.40	< 1.00	NS
Resident	53	61.53	27.54		

Vocabulary

A test of reading vocabulary was included in the battery as a measure of the ability to understand printed verbal symbols. The Word-Meaning section of the Durrell-Sullivan Reading Test was used for this purpose. Comparisons were made between the mean grade equivalent earned by day and resident students as shown in Table 7.

TABLE 7
VOCABULARY LEVEL AS MEASURED ON THE WORD MEANING SECTION OF THE DURRELL-SULLIVAN READING ACHIEVEMENT TEST

Groups	N	Mean Vocabulary Grade	S.D.	*t*	Level of Significance
Total Sample					
Day	120	4.14	1.37	1.00	NS
Resident	120	3.98	1.17		
Male Students					
Day	67	3.97	1.30	.45	NS
Resident	67	3.88	1.04		
Female Students					
Day	53	4.36	1.44	.96	NS
Resident	53	4.10	1.31		

Although differences were in the predicted direction, day and resident comparisons showed no statistically significant differences.

In the male and female comparisons, female students in both the day and resident samples earned a higher mean vocabulary grade, but the advantage did not reach the .05 level of significance.

Testing of Hypotheses: Educational Achievement

Educational achievement was measured by the Stanford Achievement Test. The earned mean grade level was the factor used in the comparisons made and reported in Table 8.

For the total sample, day students earned higher means as predicted, but the difference was not statistically significant. This suggests that the factor of residence, in and of itself, is not significant insofar as academic achievement is concerned. When male students were compared, the difference was again in the predicted direction but failed to reach statistical significance. Comparison of means of female students was consistent with the total sample and with male students; day female means were higher, but not significantly so.

The data were also analyzed to determine whether educational achievement varied with sex when the factor of residence was held constant. No significant differences were found between males and females in either the resident or the day groups.

TABLE 8

EDUCATIONAL ACHIEVEMENT AS MEASURED ON THE STANFORD ACHIEVEMENT TEST

Groups	N	Mean Achievement Grade	S.D.	t	Level of Significance
Total Sample					
Day	120	4.09	1.84	1.32	NS
Resident	120	3.80	1.58		
Male Students					
Day	67	4.01	1.77	1.10	NS
Resident	67	3.68	1.67		
Female Students					
Day	53	4.19	1.94	.70	NS
Resident	53	3.95	1.49		

Testing of Hypotheses: Psycho-Social Adjustment

Psycho-social adjustment was assessed with the H O W Behavior Rating Schedules. The data are reported here for Schedule A, Total Schedule B, and the four divisions of Schedule B. In addition to the comparisons among the research sub-groups, comparisons also are reported in some instances between the research sub-groups and the normative groups on which the H O W was standardized.

Schedule A: The Behavior Problem Record

The results of the comparison between day and resident students, shown in Table 9, suggest that the factor of institutionalization did not adversely affect the resident students. To the contrary, the mean

TABLE 9

SCHEDULE A: BEHAVIOR PROBLEM RECORD OF THE H O W BEHAVIOR RATING SCHEDULES

Groups	N	Mean Score	S.D.	t	Level of Significance
Total Sample					
Day	120	38.13	31.61	1.41	NS
Resident	120	32.66	28.57		
Male Students					
Day	67	47.07	33.21	2.22	.05
Resident	67	34.94	30.11		
Female Students					
Day	53	26.81	25.26	< 1.00	NS
Resident	53	29.77	26.21		

score of Schedule A for the day students was higher (indicating more problems) than that of the resident group. This difference, however, was not statistically significant for the total sample. When mean scores for male students were compared, a statistically significant difference (p=.05) emerged in favor of the resident male students. In contradistinction, female day and resident students were rated similar in their behavior as reflected on Schedule A of the H O W.

Mean scores for male and female resident students were not statistically different. The deviant group on Schedule A appears to be the day male students. They were found to be more poorly adjusted than female day students and, as reported above, more poorly adjusted than the resident males. Mean comparisons between male and female day students favored the female day students at the .01 level.

Total Schedule B: Behavior Rating Scale

The only significant difference between mean comparisons under Total Schedule B, given in Table 10, was with the day and resident male students where the direction was in favor of the resident males, significant at the .05 level. In a test for significance of difference between means of male day students and that of the male normative group on which Schedule B was standardized (N=1473; M=72.4; S.D.=18.4), a *t* of 3.04 was obtained which was significant (p=.01), and the variances were homogeneous. When the normative mean was compared with the mean of the male resident students, no significant difference was found.

In comparing female means with the female normative group of the H O W Total Schedule B (N=2867; M=69.2; S.D.=17.7), the female resident comparison resulted in a *t* of 1.86 and the female day comparison resulted in a *t* of 1.67, neither of which was statistically significant.

The results of the statistical analyses conducted with the data derived from the deaf females utilized in this study suggest: (a) that

TABLE 10

TOTAL SCHEDULE B: BEHAVIOR RATING SCALE OF THE H O W BEHAVIOR RATING SCHEDULES

Groups	N	Mean Score	S.D.	*t*	Level of Significance
Total Sample					
Day	120	77.24	17.32	1.34	NS
Resident	120	74.27	16.93		
Male Students					
Day	67	80.88	18.27	1.99	.05
Resident	67	74.84	16.97		
Female Students					
Day	53	72.64	14.79	< 1.00	NS
Resident	53	73.55	16.85		

neither the day nor resident females differ from those with normal hearing on Total Schedule B of the H O W Behavior Rating Schedules, and (b) neither do the deaf females differ with type of school placement, i.e., day or resident.

Tests for significance of difference between mean scores of male and female resident students did not reach the .05 level. However, mean differences between male and female day students were significant ($p=.01$) in favor of the female students.

The single group which deviated significantly from the normative group and other research subgroups with which it was compared was the day male sample. Apparently, factors have arisen in the home environments of these deaf male adolescents which present problems in adjustment. The significance of this finding is further emphasized when comparisons with the normative standardization groups of hearing subjects did not reveal differences for the resident male, resident female, and day female students.

Division I. Division I of the H O W Schedule B deals with what the constructors of the scales considered intellectual traits. Comparisons between mean scores of all subgroups, shown in Table 11, failed to reveal any statistically significant differences. Mean scores for the hearing males of the standardization group of Division I ($N=300$; $M=18.2$; $S.D.=5.9$) and the means of the two deaf samples (resident males: $t=.55$; day males: $t=.84$) did not differ significantly on intellectual traits as measured in Division I. Mean scores for the hearing females of the standardization group ($N=326$; $M=17.1$; $S.D.=5.5$) did not differ significantly from means of day females ($t=1.00$) and resident females ($t=.28$).

No significant differences were found between means of male and female resident students on Division I. However, male day and female day means were significantly different ($t=2.63$) at the .01 level. This difference between male and female day students is similar to

TABLE 11

DIVISION I, SCHEDULE B: BEHAVIOR RATING SCALE OF THE H O W BEHAVIOR RATING SCHEDULES

(intellectual adjustment)

Groups	N	Mean Score	S.D.	t	Level of Significance
Total Sample					
Day	120	17.77	5.30	< 1.00	NS
Resident	120	17.57	5.48		
Male Students					
Day	67	18.85	5.65	1.10	NS
Resident	67	17.78	5.57		
Female Students					
Day	53	16.42	4.46	< 1.00	NS
Resident	53	17.32	5.36		

that found when male and female standardization subgroups were compared (t=2.41). In both instances, the males apparently had a greater number of less-desirable behavioral traits than did the females.

Division II. This division is concerned with what the constructors of the scale refer to as physical traits. The lack of any significant differences between mean scores, given in Table 12, suggests that the factor of institutionalization does not adversely affect behavior as measured in this way.

TABLE 12
DIVISION II, SCHEDULE B: BEHAVIOR RATING SCALE OF THE H O W BEHAVIOR RATING SCHEDULES
(physical adjustment)

Groups	N	Mean Score	S.D.	t	Level of Significance
Total Sample					
Day	120	13.60	3.59		
Resident	120	13.23	3.70	< 1.00	NS
Male Students					
Day	67	13.88	4.05		
Resident	67	13.34	3.81	< 1.00	NS
Female Students					
Day	53	13.25	2.88		
Resident	53	13.09	3.55	< 1.00	NS

When tests were made between the mean scores of male and female research subgroups and the normative male and female groups, no significant differences emerged. These results suggest that neither factors of deafness nor residential placement adversely influence the behavior of male and female students such as those utilized in this study.

No sex differences emerged when the resident male and female and day male and female samples were studied. The absence of a difference between sexes on this variable in either day or residential groups is in contrast to the results of the comparison between normative male and normative female groups in Division II where the difference was significant (t=2.69) at the .01 level.

Division III. This division of Schedule B relates to social behavior, and differences in mean scores are given in Table 13.

Comparisons show that the total day sample was rated as having significantly more (p=.05) problems on this variable than the total resident sample. It seems apparent that this difference between total samples can be attributed to the higher mean scores earned by the day male students. A .05 level of significance was obtained when day male and resident male groups were compared; the difference was in favor of the resident males who were rated as having a fewer

TABLE 13
DIVISION III, SCHEDULE B: BEHAVIOR RATING SCALE OF THE H O W BEHAVIOR RATING SCHEDULES
(social adjustment)

Groups	N	Mean Score	S.D.	*t*	Level of Significance
Total Sample					
Day	120	23.30	5.82	1.99	.05
Resident	120	21.85	5.44		
Male Students					
Day	67	24.63	6.25	2.57	.05
Resident	67	22.01	5.57		
Female Students					
Day	53	21.62	4.72	< 1.00	NS
Resident	53	21.64	5.26		

number of problems than the day male students. Since this difference emerged, it was of importance to compare the two male research samples with the normative male group (N=300; M=22.4; SD=6.3) on Division III. Neither the means nor the variances between the normative male group and the resident deaf males differed significantly. However, the test between the normative male mean and the day male mean was significant (t=2.62) at the .01 level. This suggests that the day male students not only had a greater number of problems than the resident males, but they also differ significantly from the males with normal hearing on which the scale was standardized.

Unlike the day and resident male students, the female students did not differ on the basis of type of residence. Neither means nor variances differed significantly. Both day and resident female groups earned higher means, however, than did the 326 normative females (M=18.2; S.D=4.9). Comparisons between the normative female mean and the day female mean (t=4.86) and the resident female mean (t=4.42) were both significant at the .01 level. These results suggest that, with females, the factor of deafness is more basic on this variable of social behavior than is the type of school attendance.

In comparing performance on the basis of sex, with type of school placement held constant, no significant differences were found among resident students, but a significant difference (p=.01) was found between mean scores of male and female day students, in favor of the female group. This finding raises questions pertinent to the day male students, particularly since this group had significantly more problems than the resident males and hearing males as well.

Division IV. No significant differences were found between the research subgroups on Division IV of Schedule B, which relates to emotional traits; these comparisons are given in Table 14. Differences were found, however, when male and female groups were compared with the normative data. The total male research sample did

TABLE 14

DIVISION IV, SCHEDULE B: BEHAVIOR RATING SCALE OF THE H O W BEHAVIOR RATING SCHEDULES

(emotional adjustment)

Groups	N	Mean Score	S.D.	*t*	Level of Significance
Total Sample					
Day	120	22.57	7.48	< 1.00	NS
Resident	120	21.66	6.91		
Male Students					
Day	67	23.52	7.93	1.34	NS
Resident	67	21.82	6.67		
Female Students					
Day	53	21.36	6.68	< 1.00	NS
Resident	53	21.45	7.20		

not differ (t=1.54) from the normative males (M=21.82; S.D.=6.67) on Division IV, but the mean for male day students was significantly different (t=2.95) at the .01 level. This tends to give further emphasis to the special problems encountered by male day students. Day and resident females were independently compared with the normative female group (N=326; M=18.1; S.D.=5.8) on Division IV. Differences were obtained between the normative females and the day female (t=3.40) and resident female (t=3.17) groups, both significant at the .01 level. These findings suggest, again, that deafness possibly plays a more important role in this variable studied than does the type of school placement.

No significant differences were found in comparing male and female students on Division IV with type of residence held constant. This absence of difference on the basis of sex between the male and female research groups is at variance with differences (t=4.46), significant at the .01 level, between male and female normative groups.

These findings fail to show significantly adverse effects of institutionalization on behavior as rated on this variable in the study.

Discussion: Testing of Hypotheses

The major differences which emerged between the day students and the resident students were in speech and speechreading. The scores of the day students were significantly higher than those of the resident students, thus indicating that the day students had better speech and speechreading ability. This finding is reinforced by the fact that this superiority of day students appeared in each of the six participating schools. Table 15 presents the data for the individual schools. Because of the small number in some schools, no tests of statistical significance were performed. The data are presented only to demonstrate the generality of the findings for speech and speechreading.

TABLE 15

SPEECH AND SPEECHREADING FOR INDIVIDUAL SCHOOLS

(percent words correct)

School	N		Speech		Speechreading	
	Day	Resident	Day	Resident	Day	Resident
A	30	30	16.99	11.93	20.76	15.29
B	10	10	29.85	15.45	20.00	8.62
C	17	17	17.59	12.85	15.25	11.67
D	20	20	24.35	13.30	12.61	8.48
E	36	36	8.26	3.75	7.55	2.68
F	7	7	26.00	19.93	10.70	8.63

The interpretation of these findings is a matter of considerable interest. They could be interpreted as supporting the hypothesis that institutionalization is detrimental to the development of oral communication ability in deaf children. The problem arises, however, as to exactly what constitutes institutionalization. This was discussed at some length in the introductory chapter of this report.

Oralness of Environment

It is likely, in view of the success in equating the two groups, that the major difference between them was the environment after class hours, with the day students returning home and the resident students remaining in school. It is within this difference in environment, therefore, that the factors producing the differences in speech and speechreading should be sought. One difference between the two environments which immediately suggests itself is what educators of the deaf might term "oralness of the environment." Resident students in all six participating schools usually communicated with each other, and with the persons who cared for them in the evenings, by means of finger spelling and the language of signs. It is likely that the day students, when they returned home, were forced to associate to a greater extent with hearing persons who did not know manual methods of communication. This might force the day students to rely more on oral means of communication. If this were the case, the day students would have practiced speech and speechreading to a greater extent than the resident students. This alone could have been responsible for the differences found in speech and speechreading ability.

It is possible with the data of the present study to perform an indirect test of this hypothesis. Among the 120 day students, there were 16 who had deaf parents. It is likely that these day students would be exposed to a less oral environment at home than the 70 day students in the sample who had no deaf members in their families. If the hypothesis concerning the oralness of the environment were true, then the day students with no deaf members in their families should have better oral communication ability than the day students with deaf parents.

The 16 day students with deaf parents were compared with the 70 day students who had no deaf relatives in their immediate families. No significant differences emerged between the two groups on any of the control variables. Thus, the two groups were alike in chronological age, length of time in school, intelligence, type of hearing loss, degree of hearing loss, and age at onset of hearing loss. They also were alike in that both groups consisted of only day students. The major difference between them appeared to be that the group of 16 had deaf parents and the group of 70 had no deaf relatives in their immediate families.

Significant differences emerged between the two groups on several of the experimental variables. Table 16 reports the data for those variables. It will be noted that, as hypothesized, the group with deaf parents had a mean score on speech which was significantly lower than the mean speech score for the group with hearing parents. It appears, therefore, that it is this factor of "oralness of environment" or "practice effect" which accounts for the differences in speech ability. It might be argued that this is an effect of institutionalization since it is associated with residential school living, but a counter-argument can be made that it is not a *necessary* effect. The residential school environment could be modified to make it as oral as the home atmosphere provided this were considered desirable. A possible test of such modification would be to compare the speech ability of day students and resident students within residential schools which maintain a strictly oral atmosphere within the school at all times. Under such conditions, the after-class-hours environment of the resident students should be just as oral as that of the day students and no differences should exist between the two groups in speech. If this were found to be true it would argue against interpretation on the basis of institutionalization, since resident students in the oral residential schools are just as institutionalized as resident students in public residential schools in the sense that, in both cases, the school acts as a substitute for the family.

An additional test of "oralness of environment" (which had been projected as a continuation of the present study) would be to add a matched group of *day school* students to the samples of resident students and day students used in the present study. If "oralness of the

TABLE 16

COMPARISON OF DAY STUDENTS WITH DEAF PARENTS AND DAY STUDENTS WITH NO DEAF PARENTS

Variables	M (pd)[1]	M (npd)[2]	S.D. (pd)	S.D. (npd)	t	Level of Significance
Speech	8.34	19.47	7.69	18.83	3.76	.01
Finger Spelling	78.67	46.78	21.17	32.12	4.88	.01
Vocabulary	5.01	4.03	1.50	1.41	2.39	.05

[1] pd = day students with deaf parents (N = 16)
[2] npd = day students with no deaf parents (N = 70)

environment" is important to the acquisition of speech, then it might be hypothesized that day school students would be most proficient in this area, with day students next, and resident students last. This would be based on the assumption that the day school students would have the most oral environment, with the day students and resident students following in that order. Such a study, in conjunction with the suggested comparisons within oral residential schools, might help to identify definitely the reasons for the findings of the present study in speech and speechreading.

The other significant differences in Table 16 also are worthy of note. Study of the table will reveal that, although the group with deaf parents had much poorer speech than the group with hearing parents, they had significantly higher scores in finger spelling and vocabulary. It should be added that this group also had higher scores in educational achievement although the difference here did not reach statistical significance. The higher scores in finger spelling would be expected since this group with deaf parents would likely be exposed to much manual communication at home. Apparently, however, this use of manual communication also aided them in vocabulary development, although it hindered them in speech development. It should be pointed out also that no significant difference was found between the two groups in speechreading.

These findings are of interest in view of the fact that controversy has existed for many years over the relative merits of manual and oral methods of communication for teaching deaf children. For the kinds of schools involved in the present study, the data would appear to indicate that this is not an either—or proposition. This might furnish some evidence for the need to investigate the use of combinations of finger spelling and oral methods in educating deaf children.

Institutionalization

The findings in speech and speechreading have been interpreted in terms of effect rather than in terms of institutionalization. Since none of the other hypotheses in educational achievement and psychosocial adjustment was accepted on the basis of the data, the study provides no evidence that living in residential schools is detrimental to deaf children on the variables measured. These findings support those of Templin (1950). It should be pointed out, however, that in vocabulary and educational achievement, the differences in favor of the day students, although not statistically significant, were in the predicted direction.

On the other hand, the data on the H O W Behavior Rating Schedules suggested that day students exhibited more behavior problems and undesirable behavior traits than resident students. The differences were contributed largely by the male day students who exhibited poorer adjustment than any of the other groups and poorer adjustment scores than the norms for the test. This was true for the total scores on both Schedule A and Schedule B. The

greatest difference between male day students and other groups on Schedule B was in social adjustment. Assuming that the difference is a real one and not due to sampling procedures, it appears that male day students encounter problems in adjusting to the hearing community in which they live after school hours. It is interesting that this was not true for the sample of female day students. Apparently the females were better able to adjust to the hearing community and to acquire the social traits considered desirable by that community.

Intercorrelations

In order to assess relationships which might exist among the measured variables, product-moment correlation coefficients were computed. These data are summarized in Table 17. The total sample N was 240. The required correlation value at the .05 level of significance was .13; that for the .01 level was .17. These required values were expressions of probability of the computed correlations as being significantly different from zero. The relationships which were found to be statistically significant from zero are apparent in Table 17. These data were not of primary interest in the investigation and are treated here only superficially. A more detailed statistical analysis of the correlations will be reported in a future publication.

Speech

Speech proficiency as measured with the PBF Words lists was found to correlate most highly with speechreading. The *r* of .63 was conspicuously greater than the relationship between speech and other variables. The negative correlation of −.36 between speech and hearing loss is interpreted as indicating that as the degree of hearing loss becomes greater, speech proficiency is reduced. IQ and speech did not seem to be highly related functions, i.e., those with good intelligence were not necessarily those with better speech. Correlations between speech proficiency and the two total scores of A and B, and the four subtest scores of Schedule B, of the H O W ranged from −.06 to −.16. The higher the score on the H O W, the greater the problem tendencies present in an individual. This accounts for the negative correlation and suggests that better adjustment and speech proficiency are slightly related.

Speechreading

The correlation between speechreading and speech was reported in the preceding paragraph. In addition, moderate correlations were found between speechreading and: (a) vocabulary, .58; (b) educational achievement, .58; and (c) finger spelling, .50. Previous studies have found correlations of a similar magnitude between speechreading and educational achievement. For example, Utley (1946) found a correlation of .56 between Sentence Test A and educational achievement. Heider and Heider (1940) reported an *r* of .54 between these two variables. Lowell (1960) reported cor-

TABLE 17
INTER-CORRELATION COEFFICIENTS AMONG THE VARIABLES (N=240)

	Speech	Speech-reading	Finger Spelling	Vocabu-lary	Behavior Problem Record	Behavior Rating Scale	Educa-tional Achieve-ment	IQ
Speech	—							
Speechreading	.63	—						
Finger Spelling	.14	.50	—					
Vocabulary	.32	.58	.72	—				
Behavior Problem Record	—.16	—.25	—.19	—.26	—			
Behavior Rating Scale	—.13	—.20	—.17	—.26	.76	—		
Educational Achievement	.26	.58	.69	.87	—.24	—.27	—	
IQ	.15	.16	.30	.31	—.21	—.28	.37	—
Hearing Loss	—.36	—.22	.00	.00	.06	.04	.07	.06

relations of .58 and .37 between speechreading and two tests of reading comprehension; .50 between vocabulary and speechreading, and .68 between language usage and speechreading.

None of the previous studies of speechreading included measures of ability to interpret finger spelling. Thus it is interesting to find a significant correlation between these two modes of reception of verbal language. The low correlation between speechreading and intelligence has been found in a number of studies in addition to this one and emphasizes the apparent complexity of the processes involved in the task of reading lips.

Finger Spelling

A moderate correlation of .50 was found between finger spelling and speechreading as reported above. An r of only .14 emerged between finger spelling and speech. A highly significant correlation of .72 resulted between finger spelling and vocabulary. That between the interpretation of finger spelling and educational achievement was .69. The r between intelligence and finger spelling was .30. The ability to interpret finger spelling and the Divisions A and B of the H O W resulted in correlations of −.19, and −.17 respectively. The IQ and finger spelling comparison resulted in an r of .30.

Vocabulary

The Durrell-Sullivan Vocabulary Test correlated highly with the Stanford Achievement Test. The highly significant r of .87 is especially noteworthy in view of the time factor required to administer a total educational achievement test battery. The correlation between intelligence and vocabulary was .30. Those between vocabulary and Schedule A and B of the H O W were both −.26. The negative correlation suggests better vocabulary scores for those with fewer behavioral problem tendencies.

Schedule A (H O W)

Schedule A presumably reflects behavior problems of an overt nature. Schedule B is a total score which results from subtests covering four areas of behavior. The correlation between Schedule A and B was .76. The comparison between IQ and Schedule A resulted in an r of −.21. A correlation of −.24 resulted from the comparison of Schedule A and educational achievement.

Schedule B (H O W)

Spuriously high correlations resulted between the total Schedule B score and the four subtest scores. Educational achievement correlated −.27 with Schedule B and the comparison on Schedule B with IQ resulted in an r of −.28.

Educational Achievement

As reported in the several preceding sections and summarized in Table 17, educational achievement correlated significantly with each of the other variables with the exception of hearing loss. Highly significant correlations of .87, .69, and .58 resulted when educational achievement was compared with vocabulary, finger spelling, and speechreading, respectively.

IQ

The highest correlation obtained when comparing IQ with the other variables included for study resulted from the comparison with educational achievement. The correlation in this instance was .37. The low, though significant, coefficient emphasizes the limitations of non-verbal intelligence tests as predictors of educational achievement. This is an important problem which remains to be solved in psychological testing of the deaf. The other correlations ranged in magnitude from .15 to .32. A study of Table 17 shows these relationships.

Hearing Loss

Only two statistically significant correlations resulted when hearing loss was compared with other variables listed in Table 17. The correlation between hearing loss and speech proficiency was −.36 which suggests that better hearing results in better speech. The comparison between hearing loss and speechreading resulted in an r of −.22. This r is identical to that reported by Lowell (1960) when hearing loss was averaged in a similar way to which it was computed in the present study.

Discussion: Intercorrelations

The factor of intercorrelations was not a primary aspect of the present study. The investigators are aware of the limited usefulness of single-variable correlation studies in the area of deafness and the limitations of such data for the purpose of determining cause and effect relationships in general. For these reasons the intercorrelations are not treated in great detail and are presented principally as a matter of interest and for comparison with the findings of previous studies.

The three general areas of performance tested in the present study were communication, educational achievement, and psycho-social adjustment.

Communication

The measures of communication included speech, speechreading, reading of finger spelling, and vocabulary. From the standpoint of the individuals comprising the sample, one means of communication was expression, i.e., speech, whereas reading of finger spelling

(digital symbols), speechreading (labial symbols), and vocabulary (printed symbols) involved the reception of verbal symbols. In addition, the educational achievement test required the reception of printed verbal symbols.

It is interesting to find that the intercorrelations among these tasks were statistically significant beyond the .01 level. The highest correlation (.87) was between the two printed forms of communication, educational achievement and vocabulary.

Since the subjects used in this study were principally visually oriented (because of the degree of hearing loss), the printed symbol provided them the least ambiguous and most stable form of communication. The correlation of .87 cited above tends to corroborate this. Words spelled on the fingers present a fairly unambiguous symbol and differ from the printed symbol basically in relation to the factor of stability. That is, each successive letter is presented in temporal sequence and the individual, therefore, is not able to re-read a word or sentence as is the case in the vocabulary test and test of educational achievement. The most ambiguous of the means of communication used in this study was speechreading. This results from the fact that the labial aspect of some sounds are invisible and, too, many sounds look alike on the lips. The correlations appear to extend on a continuum according to this factor of clarity or unambiguity. For example, the correlations resulted as follows: vocabulary (printed) and educational achievements (printed), .87; vocabulary (printed) and finger spelling (digital), .72; educational achievement (printed) and finger spelling (digital), .69; vocabulary (printed) and speechreading (labial), .58; educational achievement (printed) and speechreading (labial), .58; finger spelling (digital) and speechreading (labial), .50.

Speech correlated most highly with speechreading, .63. The next highest correlations for the speech variable were with hearing loss, —.36; vocabulary, .32; and educational achievement, .26. The magnitude of the correlation between speech and speechreading obviously suggests that these two functions are related. However, less obvious is the possible influence of onset of deafness in this relationship. The age at onset of deafness preceded the normal development of linguistic skills in the children used in this study. In addition, the degree of deafness was profound. This required speech to be taught through the visual, tactual, and auditory systems. Mirrors to aid children in the correct formation of sounds are used extensively in speech instruction. In addition, the teacher also provides the proper model for the speech sound. Thus practice is gained in associating the visual, kinesthetic, and auditory aspects of the speech sounds. Practice effect and a form of knowledge of results in speech lessons might enhance speechreading proficiency. Other interpretations of the data in the area of communication are undoubtedly possible. However, since this study did involve measures of performance in the areas of speech and speechreading, the possibility that the quality of speech instruction or the ability to learn speech might exert a significant influence on later speechreading proficiency

is an interesting possibility which might be of interest to those dealing with young deaf children.

Educational Achievement

The means by which vocabulary and general achievement tests are presented to deaf children was related to communication in the preceding paragraphs. However, these two measures are basically measures of educational attainments. Reading achievement and content materials in several areas such as arithmetic computation, arithmetic reasoning, social studies and science are included in the Stanford Achievement test. The language skills of children are measured quite comprehensively with this test. All of the variables included in Table 17 correlated with educational achievement at the .01 level of significance. Speechreading and finger spelling correlated well with educational achievement, .69 and .58 respectively. It has been suggested in the results of several studies that language facility seems to be an important factor in speechreading success. These results tend to support this suggestion. Of equal importance, however, is the similarity in the size of the *r* between educational achievement and these two communication methods. The correlations with educational achievement suggest that finger spelling and speechreading are not necessarily in opposition to one another as has been suggested by some educators of the deaf. This was also suggested in the results of the comparison between day students with hearing parents and day students with deaf parents discussed previously in this report. The two groups did not differ in speechreading ability although the post-academic hours of the children with deaf parents were spent at home in a presumably non-oral environment. The educational achievement of the two groups was similar which reemphasizes the language factor as being important to success in the learning of communication skills.

Psycho-Social Adjustment

Intercorrelation of the H O W scores were examined for any significant relationship existing among the various communication methods as well as educational achievement. The correlations ranged from .06 to −.28 as indicated in Table 17. There was no real suggestion that any of the experimental variables was related in any marked manner to the communication skills of the subjects or their educational achievement levels.

SUMMARY AND CONCLUSIONS

The research reported in this monograph attempted to study the effects of institutionalization on the psycho-educational development of deaf children. Studies of infant isolation in hearing children have indicated that institutionalization usually is detrimental to the development of the child. If there are similarities between this type of institutionalization and the practice of segregating deaf children in residential schools, then it would be expected that the residential environment would retard the development of deaf children. The study investigated this problem by assessing two equated groups of deaf children in residential schools on a number of variables. The control group consisted of 120 day students in residential schools, and the experimental group consisted of 120 resident students in the same schools. The two groups were equated on a number of variables in order to ensure that a major difference between them was in environment after class hours, with the day students returning home and the resident students remaining in school, at least during the school week.

It was hypothesized that the resident students, as compared to the day students, would have poorer ability to communicate in the English language, poorer educational achievement, and poorer psycho-social adjustment.

The Variables

The variables were classified as control and experimental. The control variables were those on which the two groups were equated: educational environment, sex, chronological age, length of time in school, intelligence, type of hearing loss, degree of hearing loss, and age at onset of hearing loss. The experimental variables were those on which the two groups were compared: communication ability in the English language (speech, speechreading, finger spelling, and vocabulary), educational achievement, and psycho-social adjustment.

Sample

The sample consisted of 120 day students, 67 male and 53 female, and 120 resident students, 67 male and 53 female, from six residential schools for deaf children located in five different regions of the United States. All of the subjects (a) had sensori-neural hearing losses of 75 db or more in the better ear averaged across the three frequencies 500, 1000, and 2000 cps; (b) had suffered hearing impairment before the age of three years; (c) had no discernible disabilities other than deafness; and (d) were approximately 11.0 years of age or older at the time of testing. The three methods of equating the two groups were restriction of the sample, matching, and statistical equating. In actual practice only the first two methods were used. It had been planned to equate the two groups statistically for intelli-

gence by means of the analysis of covariance. Since the groups were found not to differ on this variable, the analysis of covariance was not needed.

Procedure

The data were collected from school records and by testing. School records yielded data on residence status (day or resident student), sex, chronological age, length of time in school, type of hearing loss, degree of hearing loss, age at onset of hearing loss, and educational achievement (Stanford Achievement Test). For some of the subjects the intelligence quotients also were obtained from school records where these quotients had been obtained on the Chicago Non-Verbal Examination. Where such quotients were not available in school records, the Chicago Non-Verbal Examination was administered as part of the testing program.

The testing program included speech, speechreading, finger spelling, vocabulary, and psycho-social adjustment. Speech proficiency was assessed by the intelligibility of tape-recorded samples of each subject's speech. The test materials consisted of the 50-word units of the Phonetically Balanced Familiar Words lists. Speechreading ability was assessed with the sentence portion of the filmed Utley Test of Lipreading, Form A. A filmed version of the sentence portion of Form B of this test was used as the test for the reading of finger spelling. For vocabulary, the Word Meaning section of the Durrell-Sullivan Reading Achievement Test was used. The Haggerty-Olson-Wickman Behavior Rating Schedules, A and B, were used to assess psycho-social adjustment.

Results and Conclusions

Eleven hypotheses were tested in the three general areas of communication ability, educational achievement, and psycho-social adjustment.

Communication Ability

Four hypotheses were tested. It was hypothesized that the day student group would have better speech, speechreading, finger spelling, and vocabulary performance than the resident group. The major differences which emerged between the two groups in the study were in this area. The day student group had significantly higher scores on speech and speechreading than the resident student group. No significant differences were found on the other two measures of communication ability, finger spelling and vocabulary.

Although the significant differences in speech and speechreading were in the hypothesized direction, the original interpretation of these differences as resulting from institutionalization was abandoned in favor of an interpretation in terms of "oralness of environment" or "practice effect." It was reasoned that the day students likely would be exposed to a more oral environment at home than would the resi-

dent students who resided in school where communication among themselves and with those who supervised them would likely be in finger spelling and the language of signs. Having to communicate largely with persons who were unfamiliar with manual methods of communication should force the day students to rely more on speech and speechreading than the resident students.

A test of this hypothesis was made using data obtained in the study. The 120 day students included 16 who had deaf parents and 70 who had no deaf relatives in the immediate family. It would be expected that the home environments of the day students with deaf parents would not be more oral than that of the resident students and that, therefore, their oral communication scores would be more like those of the resident students than those of the day students with normal hearing relatives. This was found to be true for speech but not speechreading. The speech scores of the day students with deaf parents were significantly lower than those of the day students with normal hearing relatives and did not differ from the speech scores of the resident students.

Two further tests of this hypothesis were proposed: (a) comparison of day students and resident students in residential schools where manual methods of communication are not used at any time; and (b) comparison of a group of day school students with the two groups used in the present study. In the first test, it would be expected that no differences in speech ability would be found between the day and resident students in purely oral residential schools since the environment for both groups would be oral at all times. In the second test, it would be expected that the day school students would have higher speech scores than either of the two groups used in the present study. Investigations of this type would help to shed light on the findings of the present study in speech and speechreading ability.

It is of interest to note that, although the day students with no deaf relatives in the immediate family obtained significantly higher scores on speech than the day students with deaf parents, they had significantly *lower* scores in finger spelling and vocabulary. Furthermore, there were no differences between the two groups in speechreading. The difference in finger spelling would be expected on the grounds that the students with deaf parents likely would be exposed more often to finger spelling and in fact, might be taught this method of communication by their parents; however, the difference in vocabulary and the lack of difference in speechreading form an interesting pattern.

When all of the variables measured in the study had been correlated with each other, it was noted that the correlations of vocabulary with finger spelling and speechreading were substantial. The correlation of vocabulary with speech, however, was much lower. This is explainable in terms of basic differences between speech and the other communication variables as a group. The only facet of speech ability which was measured in the study was intelligibility. This simply requires the subject to be able to articulate the test

words intelligibly whether he understands the meanings of the words or not. It is likely that many of the students involved in the study were unaware of the meanings of many of the test words. Thus, the vocabulary measure would not necessarily be expected to correlate highly with the speech measure.

In the case of the substantial correlations between vocabulary and the measures of speechreading and finger spelling, a different situation exists. Studies by Lowell (1960), Heider and Heider (1940), and Utley (1946) found correlations between speechreading and various measures of language ability which were almost identical in magnitude to those found in the present study. Although caution must be exercised in reasoning causally from correlation coefficients, all of these studies appear to indicate that an important contributing factor to success in speechreading is good language ability. This is borne out also by the self-observations of deaf persons with good speechreading ability. The present study appears to indicate that this is true also for ability to read finger spelling.

In speechreading, and probably to a lesser extent in the reading of finger spelling, the reader must make his judgments from incomplete cues. Many speech elements are not readily visible. The lipreader must "fill in" the elements which he cannot perceive. In order to do this, he apparently relies, to some extent, on knowing the context which is being discussed and in using his knowledge of the context to help in perceiving what is being said. In this, vocabulary probably would be an important factor. Thus, the pattern of correlations found among the communication variables seems logical and points to the importance of language ability in speechreading. This might help explain why no differences emerged in speechreading between the day students with deaf parents and those with no deaf relatives, since the former group had significantly better vocabulary development.

These data relate to another issue in the education of the deaf—the methods of communication which are used in the education process. While most schools now attempt to expose deaf children to some form of the oral method, questions are being raised concerning possible limitations in this method as it now exists. Recent studies in Russia, as reported by Morkovin (1960), indicate that the use of finger spelling in certain ways with young deaf children appears to aid them in acquiring oral communication ability. This has been termed "neo-oralism" since its goal is to foster the development of good oral communication in deaf children and finger spelling is used only as a supplementary means of achieving this goal. The substantial correlations of ability to read finger spelling with educational achievement, vocabulary, and speechreading provides support for the need for investigations of the use of manual as well as oral and written English in educating deaf children.

It is true that there was only a small correlation between the finger spelling and speech measures, and that the major findings of the study indicate that an oral environment aids in the acquisition of speech intelligibility. The work done in Russia, however, apparently

indicates that finger spelling need not be detrimental to speech, while it assists in the acquisition of language ability. Investigations of this problem are needed.

Educational Achievement

Although the differences between the day and resident student groups on educational achievement were not statistically significant, they were in the hypothesized direction. The results here also revealed the typical finding of educational retardation of deaf children as compared to hearing children. An interesting point was the high correlation of .87 between educational achievement and vocabulary. This indicates that the total score on the educational achievement test was largely determined by a student's language ability. The low correlation of .37 between educational achievement and scores on the Chicago Non-Verbal Examination supports previous findings that non-verbal tests of intelligence are not good predictors of educational achievement. This is a problem of considerable importance in the psychological testing of deaf children where non-verbal tests must be used extensively.

Psycho-Social Adjustment

The psycho-social adjustment of deaf persons is difficult to assess with the instruments now available. The language handicap of deaf children prohibits the direct administration of paper and pencil tests. Probably, individually administered projective devices would be the best means presently available, but these could not be used in a study as large as the present one. The H O W Behavior Rating Schedules were used to obtain estimates of the children's adjustment from their teachers.

In general, the scores indicated better adjustment for the resident student group. This difference was contributed largely by the male day student group who deviated quite consistently from the resident students of both sexes, from the female day students, and from the norms established on normal hearing children. Apparently this group had problems of adjustment which might have arisen from their out-of-school environment. The problem appeared to involve chiefly the area of social adjustment measured by one of the divisions of Schedule B of the H O W. This was not evident in the scores for the female day students whose social adjustment apparently was not affected by their participation with normal hearing persons after school hours.

Caution should be exercised in the interpretation of the findings concerning the adjustment of the male day students. It is possible to reason that their adjustment would have been better if they resided in school and functioned mostly with other deaf persons. It should be remembered, however, that deaf persons must eventually function, to at least some extent, with normal hearing persons. Certainly, this is likely to be true vocationally. The frustrations which the male day

students might face after class hours in functioning among normal hearing persons likely are frustrations which the resident students will someday face and for which they might be less well prepared.

In conclusion, the study revealed no evidence that living in residential schools is generally detrimental to the development of deaf children. The results indicate that residential school living is not identical to the type of environment which has been termed institutionalization. Residential schools presently are often aware of this problem and make efforts for children who live in school to return home as often as possible. Other efforts also are made to counter the effects of separation from family.

The study did reveal major differences in oral communication ability in favor of day students. These differences appear to be more understandable in terms of "oralness of environment" rather than in terms of institutionalization. Differences in adjustment scores were revealed in favor of the resident students which indicated frustrations arising perhaps from the male day students having to function with hearing persons after school hours. It was pointed out, however, that such frustration likely must be faced eventually by all deaf persons.

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